Transportation Solution for Farmers (Farm2mandi)

Aditi Yadav
Department of Computer Science
& Engineering
Meerut Institute of Engineering
and Technology, Meerut, Uttar
Pradesh

Aarohi Rajvanshi
Department of Computer Science
& Engineering
Meerut Institute of Engineering
and Technology, Meerut, Uttar
Pradesh

Sunil Kumar
Department of Computer Science
& Engineering
Meerut Institute of Engineering
and Technology, Meerut, Uttar
Pradesh

ABSTRACT

Farmers need transportation system to carry their food grain in time from their farm to mandi or cold storage. Some of them get transportation facility but most of the times not. To address this problem, developer has designed this android mobile application named "Farm2Mandi" which gives a facility to farmers for utilizing the best mode of transportation for movement of their farm produce.

Transportation of agri products to Mandi or to any sales or storage destination is important in terms of efficient timing and safety. In worse conditions such as pandemics like Covid and other natural calamities, it becomes difficult to supply food products to their respective markets. But, supply chain of food products is crucial. Therefore, "Farm2Mandi" application helps ensuring smooth and seamless supply linkages between farmers and mandi's, ware houses. This system will help in minimizing transportation time and prices of food products.

In this application, three parties are there namely farmer, transporter and administrator. The system comprises of various steps. Initially, farmer has to register on app and then login to search for available transport to his destination. If he finds the transport facility, he can book his ride on that particular date. Once the travel is completed, farmer can provide a rating or feedback for the transport in the app, which is recorded in the database according to time and transaction. Logistic charges can be reimbursed through personal or government organization. Developer would like to discuss, one future practical prospective here, that is, recommendation of best route and transport to be used by the farmer on the basis of previous data stored by user by AI processing.

Keywords
Agri products, farmer, product, transport, transport pool, Farm2Mandi.

1. INTRODUCTION
The primary goal of this project is to design and develop an application system so that transport pooling becomes more secure, more cost-efficient, and more convenient for farmers. For this requirement to be fulfilled, developer has created a mobile application known as "Farm2Mandi".

Components of "Farm2Mandi" application are a client application and data stored in server. This mobile application allows users to easily create and join transport pools with their peers. It is user-friendly, has automatic matching abilities, and transparent location reporting.

The application framework utilizes cell phones as a multifaceted gadget for resolving the obstacle of inadequate technical resources to expediate allocating information. Not only this but also, the paper recognizes and examines the stakeholders i.e. farmers and drivers and necessity based on their part in the system.[1] The study additionally addresses the logical difficulties in the scanty access and use of transport information for farmers; and eliminating information gaps to associate farmers and other stakeholders, information hindrances caused by conciliators.

This app addresses some major concerns like traffic congestion, air pollution and hike in fuel rates. For example, those who usually commute alone in separate vehicle can now travel together in fewer vehicles, and can reduce the traffic congestion noticeably in exponential terms ideally. Implementing this, will not only provide the solution for the problems of parking issues and traffic congestion by decreasing these issues, but will also prove to be a prominent step towards an eco-friendly society as :

1.1 Society Impact
Through this application, various colleges and universities' students and faculties have got inspired to choose transport pool technique over choosing to travel on their own for reaching the same destination.

The results of doing this, is actually contributing to the environment as it aids in decreasing the harmful emissions such as carbon dioxide. Developers being the research students also take part in the same and hence contribute to more eco-friendly act.[2]

1.2 Academic Impact
The component of this project that is mobile application, makes use of a blend of existing APIs, and researches to develop an optimized Transport Pool app.

1.3 Industry Impact
The future success of "Farm2Mandi" will depend on usability of application and feedback received from practical usages. If this application becomes successful, it will have a major impact on the transportation industry. In future, this application will be able to suggest farmers the best available transport route for them.

Besides the convenience it brings, this mobile application has the following features:

1) Point system for ride-and-drive rotation

2) Automated matchmaking for transport pool service

3) Transparent location reporting

2. RELATED WORK
To support farmers to get maximum yield of their crop, many organizations help them with new technologies like GPS, GSM and Mobile etc. to easily make access to weather report or information about their crop etc.[3],[4] There are many studies available which recommend to give transport facilities

for farmers from remote area or the villages. Government of India have already done many works like starting a train for farmers, interest free purchase of vehicles for transportation of crop. [5]Though there are many applications in the market which are freely available for farmers for accessing information regarding crop or weather and fertilizers but there is no application available till now which facilitates farmers with pooling of transport.

Below are few works technologically available for farmers-

Kisan App developed by IIT (Roorkee) for farmers.

Kisan Suvidha - A smart mobile phone application for farmers

Ericsson, 2016. India Ericsson Mobility Report, June 2016. https://www.ericsson.com/res/docs/2016/

mobility-report/emr-rina-june-2016.pdf

Rohith BR (2017). Feb 22, 2017, 07:27 AM IST) https://timesofindia.indiatimes.com/business/indiabusiness/ 25000-farmers-use-agriculture-app-for-real-time-weather-information/articleshow/57283453.

Saravanan Raj (2014). Mobile Phones for the extension of agriculture; Global Agricultural Innovations and future promise. New Delhi, NIPA

TRAI, 2017. Telecom Regulatory Authority of India (TRAI). Press release No.: 73/2017, September 13 2017. http://www.trai.gov.in/sites/default/files/PR_TSD130917.pdf

World Bank (2012). Mobile apps for rustic evolution by Andrew Dymond, Christine Zhenwei Qiang, Steve Esselaar and Siou Chew Kuek.

3. BACKGROUND AND TECHNOLOGIES

To meet the primary goal of developing a Transport Pooling system that is secure, convenient, and cost-efficient for students, developer designed it with inexpensive technologies that integrate harmoniously together. Developer was able to learn more about technologies that they learned about in previous courses as well as recent ones that improved their design.

The Android mobile application was developed with a number of technologies that each member of this project is now fairly familiar with. The application was created with Android Studio, and was designed with Android's programming architecture that is similar to a Model-View-Controller architecture. It was also created with Java, therefore, a strong knowledge in Java programming structures like anonymous inner class, various design patterns like Adapter, and object-oriented design concepts were required to develop a proper Android application. The software's backend utilizes Google Firebase Real-time Database. It does not require SQL code, whereas it uses a semi-structured, non-relational database design. In addition, Google provides an online console for Firebase that allows developers to view and control their stored data. [7]The database stores all core model components of the system such as user information, drive offer and ride request posts, and Transport Pool data. Additionally, the front-end of the application make use of Android layouts with XML for the purpose of designing as well as organizing the view components. It was essential for each member to understand Android's material design and design standards to create a professional and easy-to-learn user interface. Furthermore, developer has incorporated a few APIs for Google Maps and Android Firebase.

4. PROPOSED SYSTEM

Farmers need low cost transportation to transport their harvested farm produce to market place or Mandi. Poor farmers cannot afford transportations like truck or lorry fare or purchase their own. To address their problem, developer propose a low cost or almost free solution by providing them pooling facility to carry harvested products. Here, developer propose an automated system in which a farmer will download this app on his mobile by registering himself with his location. Whereas a driver who travels from point A to Mandi will also register and mark his route while travelling. This information will be online and will be displayed to all the farmers willing to travel from that route. So, a farmer will book his travel on application, and the same will be reflected to the driver travelling, so that both can communicate with each other and fix their travel.
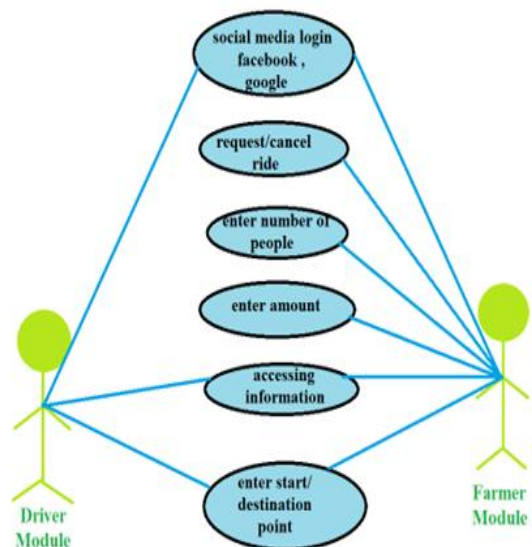

Fig. 1: Use case Diagram

This app has two stakeholders namely driver and farmer.The driver is supposed to login via their social media accounts or phone number to access the information of the rider i.e. farmer and reach the destination point. In case of farmers(or riders), they too are supposed to login via social media accounts or phone number to get access to request or cancel the ride, they are then expected to enter the number of people and amount. After this step, they are successfully connected with the driver to get the pooled vehicle for reaching their destination.
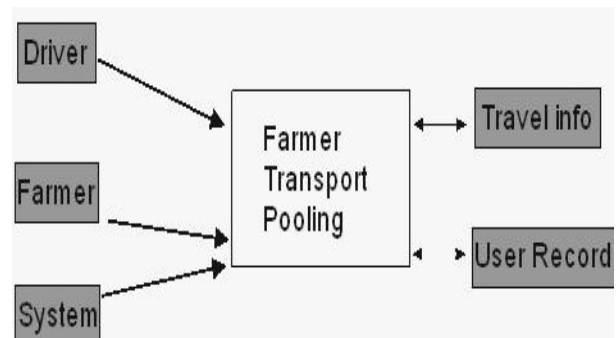

Fig. 2: Basic modules of Transport pooling application

5. DATA FLOW DIAGRAMS

The transport pooling system "farm2mandi" manages diverse modules in level zero such as drivers, farmers, vehicles,

vehicle routes and their booking and all the enquiries of drivers and farmers.
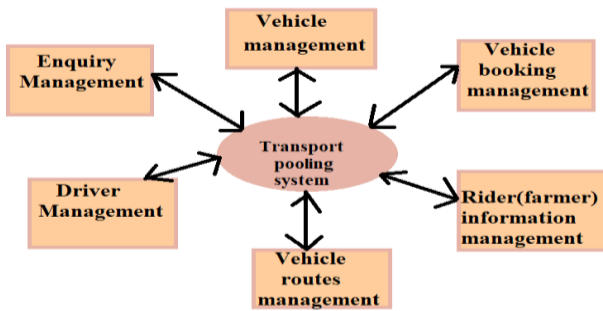

Fig. 3: Level zero data flow diagram

Furthermore, along with management, level one generates reports such as vehicle and their respective booking and routes report, enquiry report, farmer information report and checks drivers details too.

Fig. 4: Level one data flow diagram

Once the user is logged into the app, his/her credentials are checked foremostly, when they are checked , their roles are observed i.e. driver or farmer. According to their roles, their functions are managed i.e. managing of vehicle details and it's booking and router details, farmer information and driver details, cash report and enquiry details. Otherwise, if user fails to login to the app, or forgets his/her password, then an email is sent to him/her facilitating the app login.
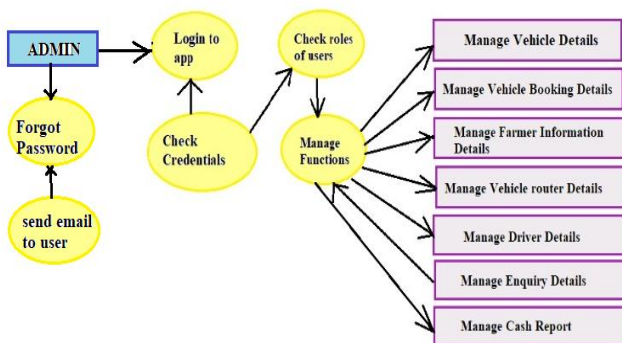

Fig. 5: Level Two Data Flow Diagram

6. METHODOLOGY

The main implementation scope of "Farm2mandi" consists of the user being able to create or join an organization, submit a post, browse through existing posts, and create or join a transport pool. Where, a transport pool is a model that consists of a potential transport pool with a driver, and several riders who are farmers. Along with these major models, the

application consists of two main functionalities: search, and transport pool validation. The searching involves queries based on the searcher's source, destination, time, and date. Transport pool validation on the other hand, takes place while a transport pool trip is going on.

7. IMPLEMENTATION

"Farm2Mandi" is developed upon traditional model-view-control methodologies. The major models being :- user, post, transport pool, and organization. The post model is divided into two subcategories: Drive Offer and Ride Request. Drive offers are created by drivers, while ride requests are created by riders looking for a potential transport pool. Upon a successful match, the driver may create a transport pool instance that takes on the maximum number of seats available from the driver's post. A transport pool object must have exactly one driver, and at least one rider in order to exist. Furthermore, for search, the algorithm takes in source, destination, time and date. Where source and destination are mandatory while date and time are optional parameters. The algorithm takes in the addresses and searches for similar posts in a circular region on the map where the diameter of the circle passes through the source and destination locations of the subject query, which allows the algorithm to not only match posts with similar source and destination, but also to pair with posts whose route passes through or near the query source and destination addresses. The other major functionality, transport pool validation, uses various factors such as GPS location of all the users involved in the transport pool, and QR code generation and detection to verify that a transport pool trip took place under valid circumstances.

Furthermore, "Farm2Mandi" consists of major algorithm: the search algorithm. The search algorithm is responsible for facilitating a search functionality. The algorithm takes source, destination, time, and date as the inputs. These inputs are entered by the user trying to search, and based on these factors the algorithm searches through the existing set of both, posts and transport pools.[9] The algorithm first narrows down its search domain by only including posts with same dates. It then narrows it further by considering an oval with the input source, and destination points at its foci. The algorithm searches for any posts or transport pools whose routes fall under that oval while also including a vector factor that ensures the considered results are moving from source to destination and not the other way around. Finally, the search results are narrowed, and sorted based on the time factor. The user can choose a time deviation factor that will be used by the algorithm to decide the final results.
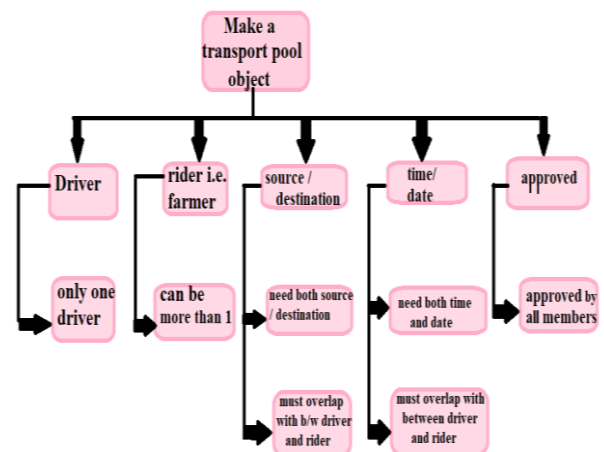

Fig. 6 : Activity Diagram

8. RESULTS

This system works on client and server site. Client is in the form of driver and farmer. Following are the snapshots of the mobile application which serve as the results of implementation work.

STEP 1 :

Fig. 7: Login Page

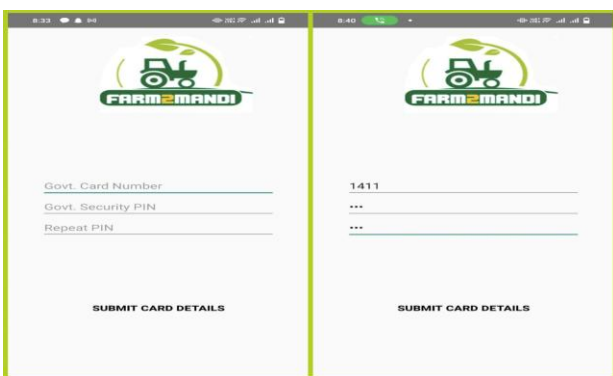### STEP 2:

Fig. 8: Registration page(Driver)

STEP 3 :-

Fig. 9: Government card details submission
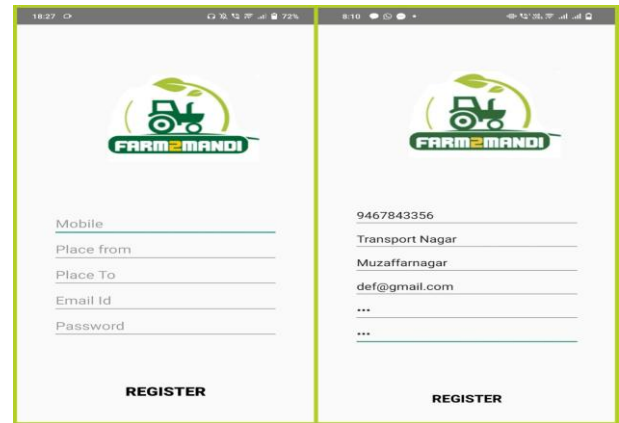
STEP 4:
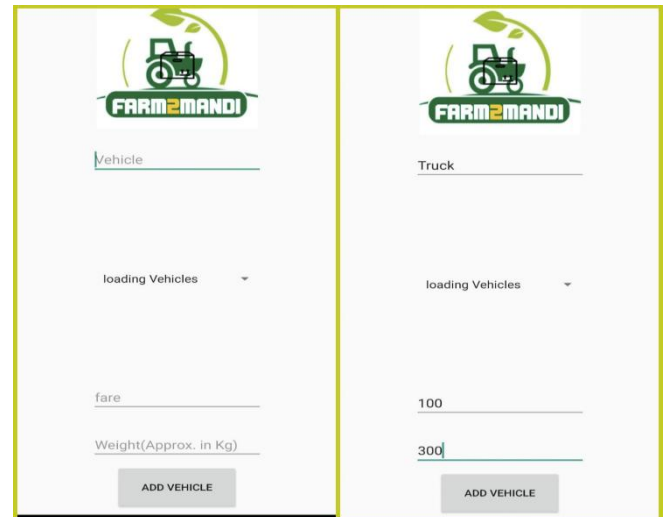

Fig. 10: Registration Page (Farmer)

STEP 5:

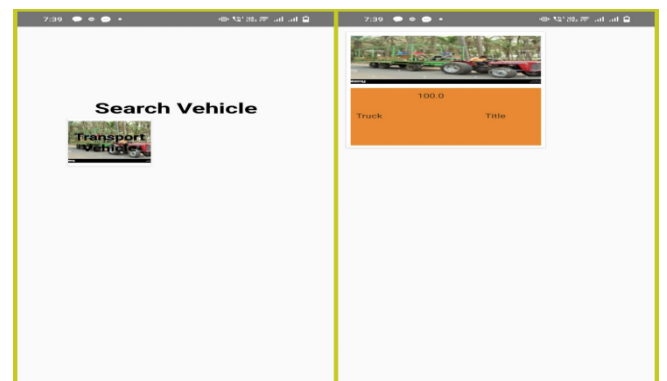**Fig. 11: Vehicle information**

STEP 6:

Fig. 12: Farmer search for vehicle
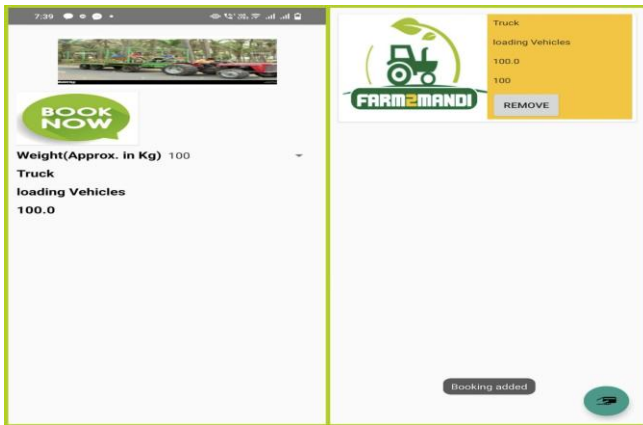
STEP 7:
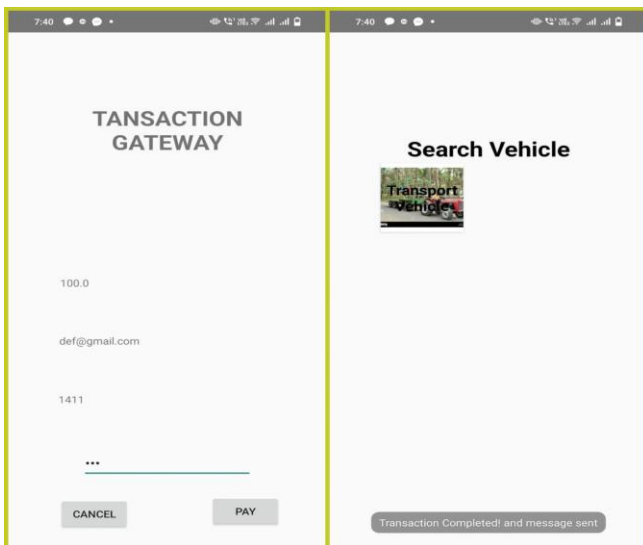

Fig. 13: Vehicle Booking

STEP 8:

Fig. 14: Transaction Page
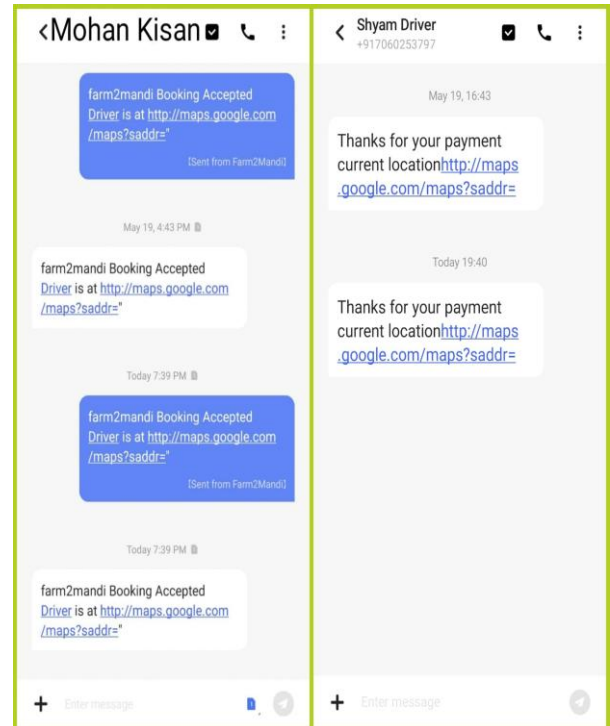
STEP 9:

Fig. 15: SMS received and sent after successful payment
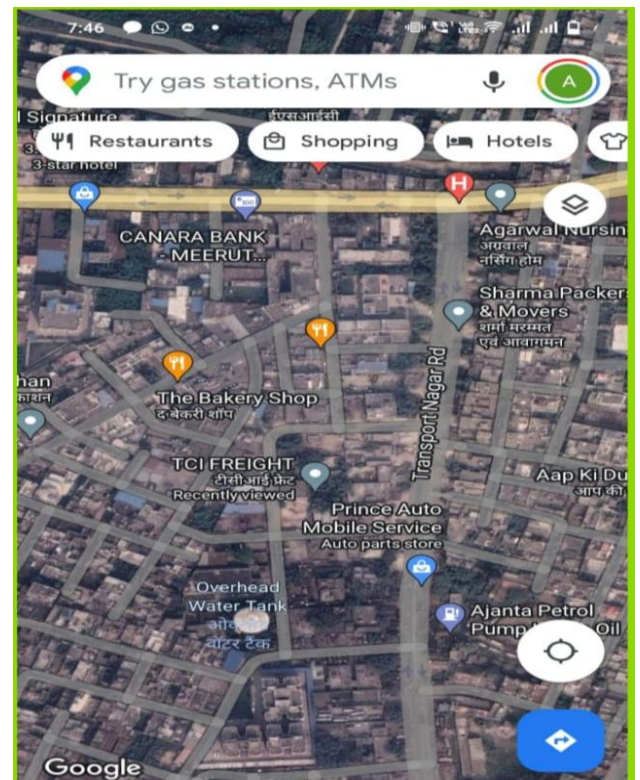
STEP 10:

Fig. 16: Location shared for pool

9. CONCLUSION

"Farm2Mandi" is a system that helps members of an organization connect and form transport pools to a common destination. The mobile application allows users to sign up and find matches for transport pools with other people in their organization. This provides a strong incentive to participate in

transport pools in areas where parking space is an increasingly difficult problem. Promoting more transport pooling has various other benefits, such as saving costs and lowering environmental impact. An organization that wants to promote transport pooling within their organization can use "Farm2Mandi" to provide a means for members to easily find potential transport pool drivers or passengers and plan the trip and handle scheduling for them, while ensuring that there will be a parking space for the driver. San Jose State University is a prime example of an organization that could use "Farm2Mandi" to solve traffic and parking space limitations by promoting transport pooling to the campus and helping students find parking more reliably. The Android mobile application of Farm2mandi works by letting users join organizations that they belong to. Once the user is a verified member of an organization, they can make posts that other members of that organization can view. Posts fall under two main categories: ride request posts and drive offer posts. Ride request posts are posts by a user that wants to be a passenger in a Transport Pool. Drive offer posts are posts where the user wants to be a driver for a Transport Pool. Users can respond to posts made by other users and form a Transport Pool that will be planned for a specific date and time in the future. The application will find the optimized route for the Transport Pool trip and notify members of a Transport Pool when others join the Transport Pool and when the trip is about to begin. After designing and implementing the core features of this application and the sensor system, Developer ran several tests to ensure functionality. Developer used techniques like white-box, black-box, and gray-box testing throughout the testing phase. Application did extensive code analysis for features like the search algorithm and sensor functions to expect passing results as well as executing the codes to view actual results.

Firebase database outputs after user input and check that the APIs were properly integrated into the application. While this was a large project with many functionalities, developer tested one another's completed code with little knowledge of its expected results like gray-box testing. developer created test suites that display user input, expected output, and actual results [15]. Each actual result was carefully analyzed and all expected output passed with flying colors. By using the mentioned testing techniques, developer was able to identify the functions that needed enhancement and which that did not need any. Farm2mandi provides a service that can be used to promote Transport Pooling. By having exclusive memberships to organizations, riders and drivers can have a higher sense of security and commonality and by providing a system that can ensure a parking space provides an additional incentive. Other application integrations, such as natural language processing or chatbots could improve the usability of the application by letting users create queries in a more flexible way and request services from the system without needing to have the application open. Built-in security features could be added to improve the safety of an application that allows strangers to communicate. Adding a rating system of both drivers and passengers would also help to promote trust within the application. Adding support for translations into other languages and other customization features could be added to make the app more versatile. Letting organizations setup custom incentive plans, such as rewards points, would also be a way to provide organizations with more flexibility.

There are two specialized features in this application:

1.) App asks for government card details from farmers, which is actually funded account by the government to individual registered farmers , so that the payment can be made from the government aided account itself.

2.) Short message service feature enhances the application as when the farmer books the ride offer , a confirmation message is sent to the corresponding driver, and also, when the farmer completes the transaction, again a transaction confirmation message is sent to the driver. Along with the message, there's an option to access current location of the farmer through Google maps by tapping on that link.

There are also a number of improvements to the parking system that could be done. Making the sensor a stand-alone device that comes working and synchronized with the mobile application out-of-the-box would be an important improvement to make the parking system scalable and standardized. Other features could be added to the sensor, such as license plate recognition for vehicle verification or more accurate location monitoring sensor that would be more reliable than single-sensor motion detection[9]. Moreover, since India's 60 percent economy depends on farmers because 60 percent of the population lives in village. Hence to uplift and modernize this percentage of the total population, developer provide them the facility to their door step by this application, which will stop their migration and solve their major problems. A small step initiative helps a lot in that direction. Furthermore, in future, automated recommendation system using AI and data analytics can be added to the application, to make it enable to recommend favorable routes and drivers and questionnaire regarding the weight of products whether it could be carried in one go or it has to be split, according to the previous data collected.[6],[11]

10. FUTURE SCOPE
While Farm2mandi can help with planning Transport Pools, there are many improvements that could be added to make it a more complete system. For the mobile application, more subtle features could be added to make it more standardized and usable[13]. Custom views and more flexibility, such as the ability to edit posts should be added to create an experience that users would expect from a standard application. Adding a private chat system would also provide a more convenient communication method between users. And in future, the process of verification could be improvised. More options for passenger verification methods, such as QR codes, NFC-base verification, or generating custom randomized text codes could be used to make the passenger verification process convenient yet secure.

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